WHAT IS CLAIMED IS:

1. A liquid sampling, atmospheric pressure, glow discharge source for the direct analysis of metals and non-metals in electrolytic solutions, comprising:

a hollow capillary having an inlet end and a discharge end opposite said inlet end;

a counter-electrode that is disposed at a predetermined distance from said discharge end of said capillary, said predetermined distance defining an electrode gap;

a first power source configured so as to maintain a glow discharge between said counter-electrode and an electrolyte solution emerging from said discharge end of said capillary; and

a first mechanism connected to said capillary and configured for moving electrolytic solution through said capillary and out of said discharge end 24 at a rate in the range of at least about 1.0 microliter/min to about 2 mL/min at atmospheric pressure.

2. An apparatus as in claim 1, wherein:

said capillary having an electrically conducting element disposed between said inlet end and said discharge end and electrically communicating with the interior of said capillary, said first power source being connected between said electrically conducting element of said capillary and said counter-electrode, said first power source being configured so as to place a potential difference in the

range of about 200 volts to about 1000 volts between said electrically conducting element of said capillary and said counter-electrode.

3. An apparatus as in claim 1, further comprising:

an injector connected in communication with said capillary for introducing into said capillary, a discrete amount of fluid containing at least one analyte sample of at least one material to be analyzed.

4. An apparatus as in claim 3, further comprising:

a second mechanism for separating any analytes in the electrolyte solution, said second mechanism being connected in fluid communication with said capillary downstream of said injector.

5. An apparatus as in claim 4, wherein said second mechanism for separating any analytes in the electrolyte solution includes a chromatography column.

6. An apparatus as in claim 1, wherein said first mechanism for moving electrolytic solution through said capillary and out of said discharge end includes a pump having an outlet connected in fluid communication with said inlet end of said capillary.

7. An apparatus as in claim 1, wherein said first mechanism is configured for moving electrolytic solution through said capillary and out of said discharge end

at a rate in the range of at least about 1 microliter/min to about 5 mL/min at atmospheric pressure.

8. An apparatus as in claim 1, wherein said capillary defines a longitudinal axis aligned parallel to the direction of flow through said capillary, and said discharge end of said capillary is disposed such that said longitudinal axis at said discharge end is disposed generally parallel to the vertical.

9. An apparatus as in claim 8, wherein said first mechanism for moving electrolytic solution through said capillary and out of said discharge end includes a second power source having one electrical lead connected to said discharge end of said capillary and a second electrical lead connected to a point of said capillary upstream of said discharge end so as to place a potential electrical difference over the length of said capillary between said discharge end and said upstream point of said capillary.

10. An apparatus as in claim 9, wherein a single power source forms both said first power source and said second power source.

11. An apparatus as in claim 1, further comprising:

a variable resistor electrically connected between said power source and one of said electrically conducting element of said capillary and said counter-electrode.

12. An apparatus as in claim 1, wherein:

said first power source is electrically connected to said capillary so that said capillary operates as the powered electrode.

13. An apparatus as in claim 1, wherein:

said first power source is electrically connected to said counter-electrode so that said counter-electrode operates as the powered electrode.

14. An apparatus as in claim 1, wherein said first power source includes one of a direct current power source, a radio frequency power source and a microwave frequency power source.

15. An apparatus as in claim 1, further comprising:

an instrument configured for analyzing electromagnetic radiation emanating from the glow discharge; and

a light directing element disposed near said electrode gap and configured to direct electromagnetic radiation from the glow discharge to said analyzing instrument.

16. An apparatus as in claim 15, wherein said light directing element includes a fiber optic light guide:

17. An apparatus as in claim 15, wherein said analyzing instrument includes a monochromator.

18. An apparatus as in claim 1, further comprising:

an instrument configured and disposed for analyzing ionized matter emanating from said glow discharge in said electrode gap.

19. An apparatus as in claim 18, wherein said instrument includes a mass spectrometer.

20. An apparatus as in claim 1, wherein at least one of said discharge end of said capillary and said counter-electrode is fixed to a selectively movable stage.

21. An apparatus as in claim 1, wherein said capillary includes a stainless steel tube with an inside diameter of 0.254 mm and said counter-electrode is formed of copper.

22. An apparatus as in claim 1, wherein said discharge end of said capillary is formed of one of an electrically semiconducting material and an electrically insulating material.

23. An apparatus as in claim 1, further comprising:

a means for flowing gas around said discharge end of said capillary, at

least a section of said gas flowing means being disposed near said discharge end of said capillary.

24. An apparatus as in claim 23, wherein said means for flowing gas around said discharge end of said capillary includes:

a gas supply conduit surrounding said discharge end of said capillary;

a supply tube connected in fluid communication with said gas supply conduit; and

a supply of gas connected in fluid communication with said supply tube.

25. A liquid sampling, atmospheric pressure, glow discharge source for the direct analysis of metals and non-metals in electrolytic solutions, comprising:

a hollow capillary having an inlet end and a discharge end opposite said inlet end, said capillary having an electrically conducting element disposed between said inlet end and said discharge end and electrically communicating with the interior of said capillary;

a means for moving electrolytic solution through said capillary and out of said discharge end at a rate in the range of at least about 1.0 microliter/min to about 5 mL/min at atmospheric pressure, said moving means being connected to said capillary;

a counter-electrode that is disposed at a predetermined distance from said discharge end of said capillary, said predetermined distance defining an electrode gap;

a first power source means for maintaining a potential difference in the range of about 200 to about 1000 volts between said electrically conducting element of said capillary and said counter-electrode and maintaining a glow discharge between said discharge end of said capillary and said counter-electrode;

a means for injecting into said capillary, a discrete amount of fluid containing a sample of at least one analyte material to be analyzed, said injecting means being connected in communication with said capillary;

a means for separating said sample into discrete volumes wherein each discrete volume being substantially composed of a single analyte, said separating means being connected in fluid communication between said injecting means and said discharge end of said capillary;

a means for flowing gas around said discharge end of said capillary, said gas flowing means including a section disposed near said discharge end of said capillary;

a means for analyzing ionized matter emanating from said glow discharge, said ion analyzing means being configured and disposed to sample ions from said glow discharge;

a means for analyzing electromagnetic radiation emanating from said glow discharge; and

a means for directing electromagnetic radiation from said glow discharge to said electromagnetic radiation analyzing means, said directing means having an input element disposed near said glow discharge.

26. A method of using a glow discharge source at atmospheric pressure for the direct analysis of metals and non-metals in electrolytic solutions, comprising:

providing a hollow capillary having an inlet end, a discharge end opposite said inlet end and an electrically conducting element disposed upstream of said discharge end and electrically communicating with the interior of said capillary;

disposing a counter-electrode spaced at a predetermined distance from said discharge end of said capillary, said space between said discharge end of said capillary and said counter-electrode defining a gap;

connecting a first power source between said electrically conducting element of said capillary and said counter-electrode so as to place a potential difference in the range of about 200 to about 1000 volts between said electrically conducting element of said capillary and said counter-electrode;

sustaining a glow discharge in said gap; and

moving a flow of electrolytic solution to said discharge end of said capillary at a flow rate in the range of at least about 1.0 microliter/min to about 2 mL/min.

27. A method as in claim 26, wherein the range of said flow rate is at least about 1.0 microliter/min to about 5 mL/min.

28. A method as in claim 26, further comprising the step of:

controlling said flow rate of electrolytic solution to said discharge end of said capillary and said potential difference so as to vaporize substantially all of

said electrolyte solution that reaches said discharge end of said capillary.

29. A method as in claim 26, further comprising the step of :

disposing said discharge end of said capillary so that said flow of said electrolyte solution reaches said discharge end with a vertically disposed direction of said flow of electrolyte solution.

30. A method as in claim 26, wherein said step of moving said flow of said electrolyte solution out of said discharge end of said capillary is accomplished by electro-osmotically flowing said electrolytic solution.

31. A method as in claim 30, wherein said step of electro-osmotically flowing said electrolytic solution includes the steps of connecting one electrical lead of a second power source to said discharge end of said capillary; and

connecting a second lead of said second power source to a point of said capillary upstream of said discharge end so as to place a potential electrical difference over the length of said capillary between said discharge end and said upstream point of said capillary.

32. A method as in claim 26, further comprising:

injecting a discrete volume of less than about 0.5 milliliters of at least one analyte into said electrolyte solution before said electrolyte solution and said discrete volume of analyte reach said discharge end of said capillary.

33. A method as in claim 32, further comprising:

passing said discrete volume of analyte through a separation mechanism before introducing said discrete volume of analyte into said electrolyte solution that eventually reaches said discharge end of said capillary.

34. A method as in claim 32, further comprising:

passing said electrolyte solution through a separation mechanism before said electrolyte solution reaches said discharge end of said capillary.

35. A method as in claim 26, further comprising:

directing electromagnetic radiation from said glow discharge to an instrument for analyzing said directed electromagnetic radiation.

36. A method as in claim 35, wherein one of a fiber optic light guide and a monochromator is used to direct said electromagnetic radiation from said glow discharge to said instrument.

37. A method as in claim 26, further comprising:

directing ionized matter emanating from said glow discharge to an instrument for analyzing said ionized matter.

38. A method as in claim 37, wherein said instrument is a mass spectrometer.

39. A method as in claim 26, further comprising:

cooling said discharge end of said capillary while sustaining said glow discharge in said gap.

40. A method as in claim 26, further comprising:

flowing gas around said discharge end of said capillary while sustaining said glow discharge.

41. A method as in claim 40, further comprising:

directing said gas flow in the same direction as the direction of said flow of electrolyte solution that reaches said discharge end of said capillary.

42. A method as in claim 26, wherein said first power source includes one of a direct current power source, a radio frequency power source and a microwave frequency power source.